GEOMETRY/INTRO TO C.A.D.

Interdisciplinary Task List Alignment

Task 1   Utilize the computer operating system

Task 2   Draw and edit entities on the computer

   MA-H-G-1   Students will find angle relationships such as vertical angles, linear pairs, complementary angles, and supplementary angles.

   MA-H-G-5   Students will integrate constructions such as segments and angles, segment bisectors, perpendiculars, angle bisectors, parallel lines, circles, arcs, and polygons.

   MA-H-G-12   Students will use properties of circles, arcs, chords, central angles, inscribed angles, and concentric circles.

   MA-H-G-16   Students will use relationships among one-, two-, and three-dimensional measures.

   MA-H-G-19   Students will represent geometric figures and properties using coordinates.

   MA-H-G-20   Students will connect the concepts of slope, distance, and midpoint to coordinate geometry.

Task 3   Plot drawings on the computer

   MA-H-G-15   Students will use proportional reasoning to solve real-world problems, to do indirect measurements, and to make scale drawings.

   MA-H-G-18   Students will convert from one measure to another within the same system.

   MA-H-G-23   Students will use the relationship between a figure and its image under a transformation (congruence, similarity, size, and scale changes).

Task 4   Manipulate computer files

Task 5   Construct dimension drawings on the computer

MA-H-G-2   Students will identify relationships between and among points, lines, and planes, such as betweenness of points, midpoint, distance, collinear, coplanar, parallel, and skew lines.

MA-H-G-15   Students will use proportional reasoning to solve real-world problems, to do indirect measurements, and to make scale drawings.

MA-H-G-16   Students will use relationships among one-, two-, and three-dimensional measures.

MA-H-G-18   Students will convert from one measure to another within the same system.

Task 6   Demonstrate a knowledge of computer hardware

Task 7   Use advanced editing techniques

MA-H-G-8   Students will use Pythagorean theorem and its converse.

MA-H-G-15   Students will use proportional reasoning to solve real-world problems, to do indirect measurements, and to make scale drawings.

MA-H-G-17   Students will use perimeter, circumference, and area of planar regions to determine volume and surface area of solids.

MA-H-G-23   Students will use the relationship between a figure and its image under a transformation (congruence, similarity, size, and scale changes).

Task 8   Draw complex entities

MA-H-G-5   Students will integrate constructions such as segments and angles, segment bisectors, perpendiculars, angle bisectors, parallel lines, circles, arcs, and polygons.

MA-H-G-11   Students will use properties of other polygons.

MA-H-G-13   Students will use inscribed and circumscribed polygons.

Task 9   Do drawings using advanced dimensioning techniques

MA-H-G-2   Students will identify relationships between and among points, lines, and planes, such as betweenness of points, midpoint, distance, collinear, coplanar, parallel, and skew lines.

MA-H-G-12   Students will use properties of circles, arcs, chords, central angles, inscribed angles, and concentric circles.

MA-H-G-16   Students will use relationships among one-, two-, and three-dimensional measures.

MA-H-G-19   Students will represent geometric figures and properties using coordinates.

Task 10   Prepare drawings on CAD using advanced command techniques

MA-H-G-2   Students will identify relationships between and among points, lines, and planes, such as betweenness of points, midpoint, distance, collinear, coplanar, parallel, and skew lines.

MA-H-G-3   Students will find the intersection of lines, planes, and solids.

MA-H-G-5   Students will integrate constructions such as segments and angles, segment bisectors, perpendiculars, angle bisectors, parallel lines, circles, arcs, and polygons.

MA-H-G-6   Students will describe, draw, and construct two-dimensional and three-dimensional figures.

MA-H-G-11   Students will use properties of other polygons.

MA-H-G-12   Students will use properties of circles, arcs, chords, central angles, inscribed angles, and concentric circles.

MA-H-G-15   Students will use proportional reasoning to solve real-world problems, to do indirect measurements, and to make scale drawings.

MA-H-G-16   Students will use relationships among one-, two-, and three-dimensional measures.

MA-H-G-20   Students will connect the concepts of slope, distance, and midpoint to coordinate geometry.

**GEOMETRY/INTRODUCTION TO COMPUTER AIDED DRAFTING
INTERDISCIPLINARY COURSE**

GFA (Geometry for All is available from Larry Helpinstine, fax: 502-564-7371, phone: 502-564-3472 or Jim Austin, phone: 502-564-2106. For more information about the CD, contact Lisa Willian, phone: 270-524-1000. Also Geometer's Sketchpad©, available from Key Curriculum Press, could be set up on CAD.

First Week   Utilize operating system, CAD station, and interface

Second/Third Week   Drawing basic entities (coordinate system)
Geometric Terms
  vertical angles   linear pair   intersection
  angle   vertex   parallel lines
  transversal   alternate interior   same-side interior
  diameter radius   concentric circles
  chord   bisect   arc
  central angle   inscribed angles   regular polygons
  complementary supplementary   tangent
  midpoint   coordinate   distance
  perpendicular   betweenness of points   coordinate plane
  dilations
Geometric Concepts
       G-1: Investigate angle relationships for vertical angles and linear pairs.
       G-1: Identify pairs of angles and solve for angle measures using polar coordinates.
       G-2: Investigate angle relationships for angles formed by a transversal and parallel lines.
       G-5: Use CAD to construct segments, angles, segment bisectors, perpendiculars, angle bisectors.
       G-23: Identify and find the image of a congruent figure after it has been reflected, rotated, translated, or dilated.
       G-23: Apply geometric transformations with and without a coordinate plane to life-related problems involving similarity, size, and scale changes.
References
  Geometry, CORD Communications
    Vertical angles – p. 23   Complementary angles – p. 27
    Supplementary angles – p. 27   Measuring angles – 1.3, p. 19
    Measuring segments – 1.2, p. 12
    Constructing parallel/perpendicular – 1.5, p. 30
    Constructions – segment bisector, 1.6, p. 36

perpendicular bisector, 1.6, p. 36
angle bisector, 1.6, p. 36
Circles – 8.5, p. 481   Arcs – 9.3, p. 533
Chords – 9.3, p. 533   Central angles – 9.3, p. 533
Inscribed angles – 9.4, p. 542   Concentric circles – 9.1, p. 518
Coordinates in space – 7.6, p. 429
Coordinate plane – 7.1-7.3, pp. 390-412 Slope – 7.3, p. 405
Distance – 7.1, p. 390   Midpoint – 7.1, p. 390
Proportional reasoning – 6.1, p. 310 Indirect measurement – 6.4, p. 331
Transformational geometry – Chapter 11, pp. 666-711
Technical Drawings (12th Edition), Prentice Hall
pp. 83-119, 371
Math Enrichment for Career and Technical Education – Construction Training Manual, CORD
pp. 159-170, 104-107, 110-120
Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
pp. 122-126, 29-30, 53, 66-69, 155, 187-197, 239-251
Geometry for All
Vertical angles and linear pair sketchpad activity
Pairs of transversals

Fourth Week   Circle, arc, polygons, and polyline commands
Geometric Terms
circle   arcs   diameter
polygons   radius   quadrants
chord   distance   quadrilateral
rectangle   square   parallelogram
trapezoid   rhombus
Geometric Concepts
G-11: Investigate formulas for sum interior and exterior angles of a polygon; each
interior angle measures of a regular polygon.
G-12: Use CAD to construct circles, diameters, concentric circles, and bisect radii.
G-12: Investigate angle relationships of arcs, central angles, and inscribed angles.
G-13: Apply inscribed and circumscribed polygons.
References
Geometry, CORD Communications
Vertical angles – p. 23   Complementary angles – p. 27
Supplementary angles – p. 27   Measuring angles – 1.3, p. 19
Measuring segments – 1.2, p. 12
Constructing parallel/perpendicular – 1.5, p. 30
Constructions – segment bisector, 1.6, p. 36
perpendicular bisector, 1.6, p. 36
angle bisector, 1.6, p. 36
Circles – 8.5, p. 481   Arcs – 9.3, p. 533
Chords – 9.3, p. 533   Central angles – 9.3, p. 533

Inscribed angles – 9.4, p. 542   Concentric circles – 9.1, p. 518
Slope – 7.3, p. 405   Distance – 7.1, p. 390   Midpoint – 7.1, p. 390
Technical Drawings (12th Edition), Prentice Hall
pp. 83-119, 371
Math Enrichment for Career and Technical Education – Construction Training Manual,
CORD
pp. 159-170
Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
pp. 122-126, 29-30, 53, 239-251
Geometry for All
Sum of interior and exterior angles activity (See attachment.)
Angle relationships in circles
Yin-Yang symbol

Fifth / Sixth Week   Edit commands and practice drawings
Geometric Terms
diagonal   leg   hypotenuse
Pythagorean Theorem   converse perimeter
circumference   perimeter   area
volume   transformations reflections
translations   rotations   dilations
scale change   congruence   similarity
Geometric Concepts
G-8: Use coordinate geometry or CAD to find the lengths of the sides of a triangle and
then apply the Converse of the Pythagorean Theorem.
G-8: Introduce, solve, and apply the formulas for the Pythagorean Theorem.
G-17: Calculate volume and surface area of solids using perimeter, circumference, and
area of planar regions.
References
Geometry, CORD Communications
Task #2 (same as 4th week)   Pythagorean theorem – 6.6, p. 341
Proportional reasoning – 6.1, p. 310
Indirect measurement – 6.4, p. 331
Area – Ch. 8, pp. 457   Surface area & volume – Ch. 10, p. 581
Transformational geometry – Ch. 11, p. 665
Reflections – 11.1, p. 666   Translations – 11.2, p. 674
Rotations – 11.3, p. 681   Dilations – 11.7, p. 705
Technical Drawings (12th Edition), Prentice Hall
pp. 83-119, 371
Math Enrichment for Career and Technical Education – Construction Training Manual,
CORD
pp. 159-170, 170-174, 184-187, 104-107, 110-120
Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
pp. 122-126, 29-30, 53, 254-255, 239-251, 187-197, 40, 46-56, 158-186
Geometry for All

Pythagorean Theorem Activity

Seventh Week Text and Layer commands
Geometric Terms
  indirect measurements   scale   rotation
Geometric Concepts
  G-15: Apply proportional reasoning to solve work problems using scale factors to
                  determine text height.
        G-16: Investigate the relationships among one-, two-, and three-dimensional measures.
References
  Geometry, CORD Communications
    Task #2 (same as 4th week)
  Technical Drawings (12th Edition), Prentice Hall
    pp. 83-119, 371
  Math Enrichment for Career and Technical Education – Construction Training Manual,
  CORD
    pp. 159-170
  Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
    pp. 122-126, 29-30, 53, 239-251
  Geometry for All
    Investigating Polyhedras Activity

Eighth/Ninth Week Utilize commands to create Multiview drawings
Geometric Terms
  segment   angle   perpendicular
  parallel   circles   arcs
  points   lines   planes
  collinear coplanar intersections
  slope   inscribed   circumscribed
  rotation   translation
Geometric Concepts and Theorems
  G-3: Investigate the intersections of lines, planes, and solids.
  G-5: Use CAD to construct segments, angles, and perpendiculars.
  G-13: Apply inscribed and circumscribed polygons.
        G-21: Create transformations in geometric systems using the array command.
                (Example: Setting up a saw utilizes a point of rotation and a translation to set up
                brick slides.)
References
  Geometry, CORD Communications
    Properties of other polygons – 5.1, p. 256; 5.2, p. 262
    Measuring angles – 1.3, p. 19   Measuring segments – 1.2, p. 12
    Constructing parallel/perpendicular – 1.5, p. 30
    Constructions -- segment bisector – 1.6, p. 36
        perpendicular bisector – 1.6, p. 36
        angle bisector – 1.6, p. 36

Arcs – 9.3   Inscribed angles – 9.4, p. 542
Definition of inscribed/circumscribed – p. 503
Betweenness – 1.2, p. 12   Midpoint – 1.2, p. 12
Distance – 1.2, p. 12   Collinear – 1.1, p. 4
Coplanar – 1.1, p. 4   Parallel – 3.1, p. 140
Parallel – 3.1, p. 140   Skew lines – 3.1, p. 140
Intersections – 1.1, p. 4   Circles – 8.5, p. 481
Arcs – 9.3, p. 533   Chords – 9.3, p. 533
Central angles – 9.3, p. 533   Inscribed angles – 9.4, p. 542
Concentric circles – 9.1, p. 518 Proportional reasoning – 6.1, p. 310
Indirect measurement – 6.4, p. 331 Coordinates in space – 7.6, p. 429
Slope – 7.3, p. 405   Distance – 7.1, p. 390
Midpoint – 7.1, p. 393
Technical Drawings (12th Edition), Prentice Hall
pp. 83-119, 371, 140-148, 548-571
Math Enrichment for Career and Technical Education – Construction Training Manual, CORD
pp. 258-260, 270-276, 295-300, 104-107, 110-120, 159-170
Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
pp. 122-126, 29-30, 53, 239-251

Tenth Week   Dimension review and dimension toolbar properties
Geometric Terms
distance   betweenness of points   indirect measurements
dilations   scale
Geometric Concepts and Theorems
G-18: Investigate the change in surface area when a dimension is increased by a specific number.
References
Geometry, CORD Communications
Betweenness – 1.2, p. 12   Midpoint – 1.2, p. 12
Distance – 1.2, p. 12   Collinear – 1.1, p. 4
Coplanar – 1.1, p. 4   Parallel – 3.1, p. 140
Skew lines – 3.1, p. 140   Proportional reasoning – 6.1, p. 310
Indirect measurement – 6.4, p. 331
Coordinates in space – 7.6, p. 429
Ratio and proportions – 6.1, p. 310
Math Enrichment for Career and Technical Education – Construction Training Manual, CORD
pp. 258-260, 270-276, 295-298, 104-107, 110-120
Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
pp. 66-69, 187-197, 155

Eleventh and
Twelfth Week   Apply dimensions to Multiviews and Plotting procedures
Geometric Terms
  distance   betweenness of points   indirect measurements
  dilations   scale
Geometric Concepts and Theorems
  G-2: Identify relationships between and among points, lines, and planes such as
              betweenness of points (segment addition), midpoint, distance, collinear, coplanar,
              parallel lines, and skew lines.
  G-15: Apply proportional reasoning to solve life-related problems using indirect
              measurements and scale drawings.
References
  Geometry, CORD Communications
    Betweenness – 1.2, p. 12   Midpoint – 1.2, p. 12
    Distance – 1.2, p. 12   Collinear – 1.1, p. 4
    Coplanar – 1.1, p. 4   Parallel – 3.1, p. 140
    Skew lines – 3.1, p. 140
    Proportional reasoning – 6.1, p. 310
    Indirect measurement – 6.4, p. 331
    Coordinates in space – 7.6, p. 429
    Ratio and proportions – 6.1, p. 310
  Math Enrichment for Career and Technical Education – Construction Training Manual,
  CORD
    pp. 258-260, 270-276, 295-298, 104-107, 110-120
  Geometry for All
    Similar Triangles Exploration Activity

Thirteenth Week Application of C.A.D. commands to create basic Isometric drawings
Geometric Terms
  point   midpoint   distance formula   coordinates   lines   planes
  distance   collinear   scale
  coplanar   parallel
Geometric Concepts and Theorems
  G-2: Apply angle relationships for angles formed by a transversal and parallel lines.
  G-6: Draw and construct two- and three-dimensional figures.
  G-15: Apply proportional reasoning to solve work problems using scale factors to
              determine text height.
  G-20: Determine the shortest distance using coordinates, distance formula, and midpoint
              formula.
  G-20: Discover the relationships between the lengths of the sides of a triangle.

References
  Geometry, CORD Communications
    Proportional reasoning – 6.1, p. 310
    Indirect measurement – 6.4, p. 331
    Coordinates in space – 7.6, p. 429
    Slope – 7.3, p. 409   Distance – 7.1, p. 390
    Midpoint – 7.1, p. 390   Solids – 1.1, p. 4
    Planes – 1.1, p. 4   Betweeness – 1.2, p. 12
    Midpoint – 1.2, p. 12   Distance – 1.2, p. 12
    Collinear – 1.1, p. 4   Coplanar – 1.1, p. 4
    Parallel – 3.1, p. 140   Skew lines – 3.1, p. 140
    Intersection of lines – 1.1, p. 4 (concepts)
    Concentric circles – 9.1, p. 518 Circles – 8.5, p. 481
    Arcs – 9.3, p. 533   Chords – 9.3, p. 533
    Central angles – 9.3, p. 533   Inscribed angles – 9.4, p. 542
    Properties of other polygons – 5.1, p. 256; 5.2, p. 262
    3-dimensional – 10.1, p. 582   2-dimensional – 7.6, p. 429
    Measuring angles – 1.3, p. 19   Measuring segments – 1.2, p. 12
    Parallel/perpendicular – 1.5, p. 30 Segment bisector – 1.6, p. 36
    Perpendicular bisector – 1.6, p. 36 Angle bisector – 1.6, p. 36
  Technical Drawings (12ᵗʰ Edition), Prentice Hall
    pp. 140-148, 548-571, 83-119, 371
  Math Enrichment for Career and Technical Education – Construction Training Manual,
  CORD
    pp. 258-260, 270-276, 295-300, 104-107, 110-120, 159-170
  Practical Problems in Mathematics for Drafting and CAD (2ⁿᵈ Edition), Larkin (ITP)
    pp. 122-126, 29-30, 53, 239-251
  Geometry for All
    Shortest Distance Activity
    Triangle Inequalities Activity

Fourteenth and
Fifteenth Week Application of C.A.D. commands to create basic Section drawings
Geometric Terms
  vector   speed   direction
  planes   perpendicular   points
  lines   distance   parallel
  intersections   betweenness of points   collinear
  coplanar   slope   circle
  arc   midpoint
Geometric Concepts and Theorems
  G-2: Apply relationships between points, lines, and planes.
  G-3:   Find intersection of lines, planes, and solids to create sectional views.
  G-5: Utilize constructions for circles, arcs, and perpendiculars.
  G-6: Describe, draw, and construct two- and three-dimensional figures.

G-7: Explore the relationships between angles and sides of triangles.
G-22: Explore the concepts of vectors.
References
  Geometry, CORD Communications
    Properties of other polygons – 5.1, p. 256; 5.2, p. 262
    tweenness – 1.2, p. 12   Midpoint – 1.2, p. 12   Distance – 1.2, p. 12   Collinear – 1.1,
p. 4   Coplanar – 1.1, p. 4   Parallel – 3.1, p. 140
              Skew lines – 3.1, p. 140   Intersection of lines – 1.1, p. 4 (concepts)
              Solids – 1.1, p. 4   Planes – 1.1, p. 4
              Properties of other polygons – 5.1, p. 256; 5.2, p. 262
    3-dimensional – 10.1, p. 582   2-dimensional – 7.6, p. 429
    Measuring angles – 1.3, p. 19   Measuring segments – 1.2, p. 12
    Parallel/perpendicular – 1.5, p. 30 Segment bisector – 1.6, p. 36
              Perpendicular bisector – 1.6, p. 36 Angle bisector – 1.6, p. 36
  Technical Drawings (12th Edition), Prentice Hall
    pp. 140-148, 548-571, 83-119, 371
  Math Enrichment for Career and Technical Education – Construction Training Manual,
  CORD
    pp. 258-260, 270-276, 295-300, 104-107, 110-120, 159-170
  Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
    pp. 122-126, 29-30, 53, 239-251
  Geometry for All
    Exploring the Relationships Activity
  Vector Website
    http://standards.nctm.org/document/eexamples/chap7/7.1/index.htm

Sixteenth Week Application of C.A.D. commands to create basic Auxiliary drawings
Geometric Terms
        quadrilateral   parallelogram   trapezoid   square   rectangle   rhombus
  slope   distance   diagonals
        planes   perpendicular   points
  lines   distance   parallel
  intersections   betweenness of points   collinear
  coplanar   slope   circle
  arc   midpoint
Geometric Concepts and Theorems
  G-2: Apply relationships between points, lines, and planes.
  G-3: Find intersection of lines, planes, and solids to create auxiliary views.
  G-5: Utilize constructions for circles, arcs, and perpendiculars.
  G-10: Investigate properties of parallelograms.
  G-19: Identify a special quadrilateral plotted on a coordinate plane utilizing slope and
              distance to determine specific properties.

Geometry/ Introduction to CAD – Weekly Geometry Terms/Resources

References
  Geometry, CORD Communications
    Properties of other polygons – 5.1, p. 256; 5.2, p. 262
    Betweenness – 1.2, p. 12   Midpoint – 1.2, p. 12   Distance – 1.2, p. 12   Collinear –
1.1, p. 4   Coplanar – 1.1, p. 4   Parallel – 3.1, p. 140
              Skew lines – 3.1, p. 140   Intersection of lines – 1.1, p. 4 (concepts)
              Solids – 1.1, p. 4   Planes – 1.1, p. 4
              Properties of other polygons – 5.1, p. 256; 5.2, p. 262
    3-dimensional – 10.1, p. 582   2-dimensional – 7.6, p. 429
    Measuring angles – 1.3, p. 19   Measuring segments – 1.2, p. 12
    Parallel/perpendicular – 1.5, p. 30 Segment bisector – 1.6, p. 36
              Perpendicular bisector – 1.6, p. 36 Angle bisector – 1.6, p. 36
  Technical Drawings (12th Edition), Prentice Hall
    pp. 140-148, 548-571, 83-119, 371
  Math Enrichment for Career and Technical Education – Construction Training Manual,
  CORD
    pp. 104-107, 110-120, 159-170, 258-260, 270-276, 295-300
  Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
    pp. 122-126, 29-30, 53, 239-251
  Geometry for All
    Diagonals, angles, and opposite sides Activity

Seventeenth Week Advanced dimensioning techniques (Ordinate and Tolerance)
Geometric Terms
  distance   betweenness of points   coordinate plane
  coplanar   collinear
Geometric Concepts and Theorems
  G-2: Apply relationships between points, lines, and planes.
  G-4: Set up and solve algebraic equations to find the measures of angles and sides of
              various shapes.
  G-19: Represent geometric figures using coordinates.
References
  Geometry, CORD Communications
    Betweenness – 1.2, p. 12   Midpoint – 1.2, p. 12   Distance – 1.2, p. 12   Collinear –
1.1, p. 4   Coplanar – 1.1, p. 4   Parallel – 3.1, p. 140
              Skew lines – 3.1, p. 140   Concentric circles – 9.1, p. 518
              Circles – 8.5, p. 481   Arcs – 9.3, p. 533
              Chords – 9.3, p. 533   Central angles – 9.3, p. 533
              Inscribed angles – 9.4, p. 542   Coordinates in space – 7.6, p. 429
  Math Enrichment for Career and Technical Education – Construction Training Manual,
  CORD
    pp. 258-260, 270-276, 295-298

        Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
    pp. 122-126, 29-30

Eighteenth Week Advanced dimensioning techniques (Geometric dimensioning)
Geometric Terms
    cpctc   corresponding parts   distance   betweenness of points   coordinate plane
  coplanar   collinear   perpendicular   angles
        parallel   circular   concentric
Geometric Concepts and Theorems
    G-2 Identify the relationships between and among points, lines, and planes, such as
        betweenness of points, midpoint, distance, collinear, coplanar, parallel, and skew
        lines.
    G-12 Use properties of circles, arcs, chords, central angles, inscribed angles, and
        concentric circles.
    G-14: Identify corresponding parts of congruent triangles.
    G-14: Identify patterns for showing triangles congruent (SSS, SAS, ASA) including
        congruence statements.
References
  Geometry, CORD Communications
    Betweenness – 1.2, p. 12   Midpoint – 1.2, p. 12   Distance – 1.2, p. 12   Collinear –
1.1, p. 4   Coplanar – 1.1, p. 4   Parallel – 3.1, p. 140
        Skew lines – 3.1, p. 140   Concentric circles – 9.1, p. 518
        Circles – 8.5, p. 481   Arcs – 9.3, p. 533
        Chords – 9.3, p. 533   Central angles – 9.3, p. 533
        Inscribed angles – 9.4, p. 542   Coordinates in space – 7.6, p. 429
  Math Enrichment for Career and Technical Education – Construction Training Manual,
  CORD
    pp. 258-260, 270-276, 295-298
  Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
    pp. 122-126, 29-30

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**GEOMETRY/DRAFTING FUNDAMENTALS
INTERDISCIPLINARY COURSE**

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First Week Orientation, Requirements, Safety

Second Week   Freehand sketch orthographic views and pictorials
Geometric Terms
  Parallel   Vertical   Radius
  Triangle   Horizontal   Diameter
  Perpendicular   Construction lines
  Oblique hidden lines   Properties
Geometric Concepts
  G-6 Describe, draw, and construct 2-D and 3-D figures.
  G-15 Use proportional reasoning to: solve real world problems

do indirect measurements
to make scale drawings.
References
 Geometry, CORD Communications
  Construction – p. 42, #4-7; pp. 36-41 Vertical angles – p. 23
 3-D figures – 7.6, p. 429; 10.1, p. 582 Proportions – 6.1, p. 310
 Indirect measurement – 6.4, p. 331
 Technical Drawings (12th Edition), Prentice Hall
  pp. 71 and pp.120-148
 Math Enrichment for Career and Technical Education – Construction Training Manual, CORD
  pp. 104-107, pp, 110-120, 295-300.

Third Week Demonstrate correct lettering techniques
Geometric Terms
 Line of symmetryReflection Point of rotation
 Rotation Translation
Geometric Concepts
 G-21 Introduce reflections, translations, and rotations.
References
 Geometry, CORD Communications
  Transformational geometry – Ch. 11
 Technical Drawings (12th Edition), Prentice Hall
  pp. 71-76.
  Math Enrichment for Career and Technical Education – Construction Training Manual, CORD
  pp. 44-45.

Fourth Week   Use and maintain basic drafting equipment
Geometric Terms
  Vertical angles Linear pairs   Complementary angles
  Supplementary angles   Point
  Segment   Angle   Line
  Perpendicular   Parallel   Circle
  Arc   Concentric circles Corresponding parts
  Congruent
Geometric Concepts
  G-1 Introduce vertical angles, linear pairs, complementary angles, and supplementary
    angles.
  G-5 Perform basic constructions.
  G-7 Introduce the sum of the measures of the angles of a triangle equals 180°, the
    longest side of a triangle is across from the largest angle, the sum of the lengths of
    two sides of a triangle is greater than the length of the third side, and the sides of a
    triangle opposite congruent angles are congruent.
  G-9 Construct various angles using 45-45-90 triangles and 30-60-90 triangles.
  G-12 Identify parts of circles and central angles.
  G-14 Identify corresponding parts using transfer with congruent triangles and polygons.
References
  Geometry, CORD Communications
    Vertical angles – 1.3, p. 23
    Complementary angles – 1.4, p. 27
    Supplementary angles – 1.4, p. 27
    Corresponding parts – pp. 204-209

Technical Drawings (12th Edition), Prentice Hall
  pp. 83-119, 371
    Math Enrichment for Career and Technical Education – Construction Training Manual, CORD
  pp. 241-249.
    Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
  pp. 252-256, 122-126.

Fifth / Sixth Week   Demonstrate geometric construction techniques
Geometric Terms
  Segment bisector Angle bisector   Chord
  Polygon   Triangle   Quadrilateral
  Pentagon   Hexagon   Heptagon
  Octagon   Convex   Concave
  Central angles   Inscribed anglesInscribed
  Circumscribed   Corresponding parts
Geometric Concepts
  G-5 Perform constructions that form polygons.
  G-8 Introduce, solve, and apply the Pythagorean theorem and its converse.
  G-12 Identify central and inscribed angles in circles.
  G-13 Perform constructions that inscribe and circumscribe polygons.
  G-14 Identify patterns for showing triangles congruent (SSS, SAS, ASA).
References
  Geometry, Cord Communications
    Patterns -- pp. 204-217   Polygons – pp. 255-261
    Central/Inscribed angles -- pp. 533-548
          Congruent triangles – 4.1, pp. 204-210
    Proving triangles congruent – 4.2, pp. 211-223
    Similarity of two polygons – 4.3, pp. 211-223; 6.2, pp. 316-322
    Segments – 1.2, p. 12   Angles – 1.3, p. 19
    Segment bisectors – 1.6, p. 36   Perpendicular bisectors – 1.6, p. 36
    Angle bisectors – 1.6, p. 36   Circles – 8.5, p. 481
    Arcs – 9.3, p. 533   Chords – 9.3, p. 533
    Concentric circles – 9.1, p. 518
      Technical Drawings (12th Edition), Prentice Hall
  pp. 83-119, 371
      Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
  pp. 239-251.

Seventh Week   Identify and draw the Alphabet of lines

Eighth/Ninth Week Use architect, metric, civil, and mechanical engineer's scales
Geometric Terms
  Similar   Dilations   Proportions

Scale factor   Scale drawing
Geometric Concepts
  G-15 Apply proportional reasoning to solve real world problems using scale factors
     involving of 1/8" equals 1 foot (plan to lot) in developing scale drawings.
  G-18 Convert one measure to another within the same system through zoom command.
  G-23 Introduce dilations using zoom command.
  G-23 Develop the concept of similarity of triangles and polygons using dilations and
     zoom command.
References
  Geometry, CORD Communications
    Proportional reasoning – 6.1, p. 310
    Indirect measurement – 6.4, p. 331
    Figures/images under transformations – Ch. 11, pp. 666-711
        Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
              pp. 66-69 (Selected Exercises), pg. 155, pp.187-197.

Geometry/Intro to C.A.D. Interdisciplinary Task List Alignment

Tenth Week   **Drawing setup procedures, construct one view drawings, construct title and revision blocks, and materials list**

Geometric Terms
  Point   Line   Plane
  Betweenness of points (segment addition)Midpoint
  Distance   Collinear   Coplanar
  Skew lines
  Review previous terminology
Geometric Concepts and Theorems
  G-2 Develop relationships between points, lines, and planes.
  G-2 Introduce skew lines through 3-D modeling and oblique surfaces.
  G-5 Integrate constructions of segments, angles, segment bisectors, perpendiculars,
    angle bisectors, parallel lines, circles, arcs, and polygons through 3-D modeling
    and oblique surfaces.
  G-12 Use properties of circles, arcs, chords, central angles, inscribed angles, and
    concentric circles through 3-D modeling and oblique surfaces.
References
  Geometry, CORD Communications
    Betweenness – 1.2, p. 12   Midpoint – 1.2, p. 12
    Distance – 1.2, p. 12   Collinear – 1.1, p. 4
    Coplanar – 1.1, p. 4   Parallel – 3.1, p. 140
    Skew lines – 3.1, p. 140   Circles – 8.5, p. 481
    Arcs – 9.3, p. 533   Chords – 9.3, p. 533
    Central angles – 9.3, p. 533   Inscribed angles – 9.4, p. 542
    Concentric circles – 9.1, p. 518   Measuring angles – 1.3, p. 19
    Measuring segments – 1.2, p. 12   Parallel/perpendicular – 1.5, p. 30
    Segment bisector – 1.6, p. 36   Perpendicular bisector – 1.6, p. 36
    Angle bisector – 1.6, p. 36
        Technical Drawings (12th Edition), Prentice Hall
         pp. 83-119, 371
        Math Enrichment for Career and Technical Education – Construction Training Manual,
        CORD
         pp. 258-260, 270-276.
        Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
    pp. 29-30, 239-251.

Eleventh thru
Fourteenth Week   Draw orthographic views and construct multiview drawings
Geometric Terms
  Solids   Conic sections   Volume
  Surface area   Slope   Midpoint
  Distance   X-axis   Y-axis
  Origin

Geometric Concepts and Theorems
  G-2 Apply relationships of points, lines, and planes in drawings.
  G-2 Apply betweenness of points, midpoint, distance, collinear, coplanar, parallel, and
    skew lines to drawings.
  G-3 Identify the intersections of lines, planes, and solids in drawings.
  G-6 Draw two-dimensional and three-dimensional figures.
  G-16 Determine the change in area, volume, and surface area given a change in the
    width or length of a figure.
  G-20 Use a coordinate plane to develop drawings using slope, distance, and midpoint.
  G-20 Verify the placement of drawings on graph paper using midpoint, slope, and
    distance formulas.
References
  Geometry, CORD Communications
    Betweenness – 1.2, p. 12   Midpoint – 1.2, p. 12
    Distance – 1.2, p. 12   Collinear – 1.1, p. 4
    Coplanar – 1.1, p. 4   Parallel – 3.1, p. 140
    Skew lines – 3.1, p. 140   Intersection – 1.1, p. 4
    Three-dimensional – 7.6, p. 429; 10.1, p. 582
        Technical Drawings (12th Edition), Prentice Hall
    pp. 140-148, 548-571
        Math Enrichment for Career and Technical Education – Construction Training Manual,
  CORD
              pp. 159-170.

Fifteenth thru
Seventeenth Week Apply basic dimensioning techniques
Geometric Terms
  Alternate interior angles   Alternate exterior angles
  Corresponding angles   Same side interior angles
  Same side exterior angles
Geometric Concepts and Theorems
  G-2 Identify and apply properties of angles formed by parallel lines to locate where
    an item goes on a drawing.
  G-2 Apply betweenness of points, midpoint, distance, collinear, coplanar, and skew
    lines in describing size and location of objects on drawings.
References
  Geometry, CORD Communications
    Betweenness – 1.2, p. 12   Midpoint – 1.2, p. 12
    Distance – 1.2, p. 12   Collinear – 1.1, p. 4
    Coplanar – 1.1, p. 4   Parallel – 3.1, p. 140
    Skew lines – 3.1, p. 140
        Math Enrichment for Career and Technical Education – Construction Training Manual,
  CORD
    pp. 270-276, pp. 295-298.

Eighteenth Week Prepare drawings using ink and reproduction processes
Review of terminology in bullets G-2, G-5, and G-12

Use these geometry activities throughout the semester.
Solve mathematical problems related to drafting
Geometric Terms
  Isosceles triangle Equilateral triangle Altitude
  Median   Parallelogram   Rectangle
  Square   Rhombus   Vector
  Speed   Direction   Leg
  Hypotenuse Volume   Circumference
  Perimeter   Surface area   Tangent
  Sine   Cosine
Geometric Concepts and Theorems
  G-4 Set up and solve algebraic equations to find the measures of angles and sides of
    various shapes.
  G-9 Introduce, solve, and apply trigonometric ratios.
  G-10 Apply properties of quadrilaterals to center specific quadrilaterals in the work
    area.
  G-17 Solve problems using perimeter, circumference, and area of planar regions to
    determine volume and surface area of solids.
        G-22   Explore the concept of vectors.
              (http://standards.nctm.org/document/eexamples/chap7/7.1/index.htm)
References
  Geometry, CORD Communications
    Triangle sum – 3.4, p. 162   Triangle inequality – 3.6, p. 179
    Isosceles triangle – 3.4, p. 162; 4.4, p. 224
    Equilateral triangle – 3.4, p. 162; 4.4, p. 224
    Pythagorean theorem – 6.6, p. 341
    Altitude – 4.5, p. 231   Median – 4.5, p. 231
    Trigonometric ratios – Tangent – 6.8, p. 354; Sine/cosine – 6.9, p. 361
    45-45-90 triangle – 6.7, p. 348   30-60-90 triangle – 6.7, p. 348
        Math Enrichment for Career and Technical Education – Construction Training Manual,
  CORD
    pp. 170-174, 184-187.
        Practical Problems in Mathematics for Drafting and CAD (2nd Edition), Larkin (ITP)
    pp. 46-56, 158-186, 40.
  Illuminations Vector lesson through the National Council of Teachers of Mathematics
    website
    http://standards.nctm.org/document/eexamples/chap7/7.1/index.htm

GEOMETRY/DRAFTING FUNDAMENTALS

Interdisciplinary Task List Alignment

Geometry/Intro to C.A.D. Interdisciplinary Task List Alignment

Task 1 Use and maintain basic drafting equipment and machines

MA-H-G-1 Students will find angle relationships such as vertical angles, linear pairs, complementary angles, and supplementary angles.

MA-H-G-5 Students will integrate constructions such as segments and angles, segment bisectors, perpendiculars, angle bisectors, parallel lines, circles, arcs, and polygons.

MA-H-G-9 Students will use right triangle relationships such as trigonometric ratios (45-45-90 and 30-60-90 triangles).

MA-H-G-12 Students will use properties of circles, arcs, chords, central angles, inscribed angles, and concentric circles.

MA-H-G-14 Students will prove triangles and other polygons congruent and similar, and explore corresponding parts relationships.

Task 2 Use architects, metric, civil, and mechanical engineer's scales

MA-H-G-15 Students will use proportional reasoning to solve real-world problems, to do indirect measurements, and to make scale drawings.

MA-H-G-18 Students will convert from one measure to another within the same system.

MA-H-G-23 Students will use the relationship between a figure and its image under a transformation (congruence, similarity, size, and scale changes).

Task 3 Identify and draw the alphabet of lines

Task 4 Demonstrate correct lettering techniques

Task 5 Construct one view drawings

MA-H-G-2 Students will identify relationships between and among points, lines, and planes, such as betweenness of points, midpoint, distance, collinear, coplanar, parallel, and skew lines.

MA-H-G-5   Students will integrate constructions such as segments and angles, segment bisectors, perpendiculars, angle bisectors, parallel lines, circles, arcs, and polygons.

MA-H-G-12   Students will use properties of circles, arcs, chords, central angles, inscribed angles, and concentric circles.

Task 6   Reproduce drawings

Task 7   Prepare drawings using ink

Task 8   Utilize proper drawing setup procedures

Task 9   Demonstrate geometric construction techniques

MA-H-G-5   Students will integrate constructions such as segments and angles, segment bisectors, perpendiculars, angle bisectors, parallel lines, circles, arcs, and polygons.

MA-H-G-12   Students will use properties of circles, arcs, chords, central angles, inscribed angles, and concentric circles.

MA-H-G-13   Students will use inscribed and circumscribed polygons.

MA-H-G-14   Students will prove triangles and other polygons congruent and similar, and explore corresponding parts relationships.

MA-H-G-23   Students will use the relationship between a figure and its image under a transformation (congruence, similarity, size, and scale changes).

Task 10   Draw orthographic views and transfer features

MA-H-G-2   Students will identify relationships between and among points, lines, and planes, such as betweenness of points, midpoint, distance, collinear, coplanar, parallel, and skew lines.

MA-H-G-3   Students will find the intersection of lines, planes, and solids.

MA-H-G-6   Students will describe, draw, and construct two-dimensional and three-dimensional figures.

MA-H-G-16   Students will use relationships among one-, two-, and three-dimensional measures.

MA-H-G-20   Students will connect the concepts of slope, distance, and midpoint to coordinate geometry.

Task 11   Freehand sketch orthographic and pictorial views

MA-H-G-6   Students will describe, draw, and construct two-dimensional and three-dimensional figures.

MA-H-G-15   Students will use proportional reasoning to solve real-world problems, to do indirect measurements, and to make scale drawings.

Task 12   Construct multiview drawings from pictorial sketches

MA-H-G-2   Students will identify relationships between and among points, lines, and planes, such as betweenness of points, midpoint, distance, collinear, coplanar, parallel, and skew lines.

MA-H-G-3   Students will find the intersection of lines, planes, and solids.

MA-H-G-6   Students will describe, draw, and construct two-dimensional and three-dimensional figures.

MA-H-G-16   Students will use relationships among one-, two-, and three-dimensional measures.

MA-H-G-20   Students will connect the concepts of slope, distance, and midpoint to coordinate geometry.

Task 13 Apply basic dimensioning techniques

MA-H-G-2   Students will identify relationships between and among points, lines, and planes, such as betweenness of points, midpoint, distance, collinear, coplanar, parallel, and skew lines

Task 14   Solve mathematical problems related to drafting

MA-H-G-4   Students will connect geometric diagrams with algebraic representations.

MA-H-G-7   Students will use angle and side relationships such as triangle sum theorem, triangle inequalities, isosceles and equilateral triangle properties, altitude, and median.

MA-H-G-8   Students will use Pythagorean theorem and its converse.

MA-H-G-9   Students will use right triangle relationships such as trigonometric ratios (45-45-90 and 30-60-90 triangles).

MA-H-G-10 Students will use properties of quadrilaterals such as classification.

MA-H-G-17 Students will use perimeter, circumference, and area of planar regions to determine volume and surface area of solids.

MA-H-G-22 Students will explore concepts of vectors.

Task 15   Construct title blocks, revision blocks, materials list and tolerance blocks